nord electro 2

virtual electromechanical

SERVICE MANUAL

Clavia

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The Nord Electro Service manual is arranged to help our service centers in the best way possible. However the Nord Electro user manual is a very useful guide, use it as a reference in addition to this service manual. If you have access to internet you'll find the user manual available for download and also a lot of useful information on our website www.clavia.se

⚠ The information in this service manual is intended for service centers that repair Clavia products. It may **not** be copied, reposted, modified, served from other web pages, made into derivative works or distributed to other sources such as end users or retailers that do not repair Clavia products.

⚠ In this manual the Nord Electro and Electro 2 will be referred to as **Nord Electro**

⚠ Important safety information

Dangerous voltage levels are present within the unit.

- Unit should be opened exclusively by qualified service personnel.
- Always disconnect the power supply cord before opening to avoid electrical shock.
- Components and complete circuitboards may only be put into service when they are securely fixed in the instrument casing.

Take necessary precautions against ESD before opening the unit.

Revision history

rev. 1.0 - First release
rev. 1.1 - Corrected errors in the H/W description
- Added test program instructions
rev. 1.2 - Layout changes
- Updated Hw / Sw section, overview and test program section
- Added part list

Overview

Product line

There are three different Nord Electro Models:

- 73 note keyboard version
- 61 note keyboard version
- Rack version

Rack version

61 note keyboard version

73 note keyboard version

Internal memory

The internal sound memory of Nord Electro consists of 6 banks (A-F) holding 8 programs each for a total of 48 programs**.**

Fuse ratings

Voltage	115 V	230 V
Fuse	300 mA	125 mA

Physical Dimensions

Electro 73
W: 1115 mm
D: 295 mm
H: 95 mm
Weight: 9,4Kg / 20 lbs

Electro 61
W: 900 mm
D: 295 mm
H: 95 mm
Weight: 7,8Kg / 17 lbs

Electro Rack
W: 19”
D: 105mm
H: 4 rack units
Weight: -

Test program

Running the test program

The test program is stored in the BootPROM position **U17**.
Test program version is shown on the LED display when the test program is initiated.
If BootPROM version is older than 0.20, there is no test program available.
To find out which version that is installed, the Nord Electro needs to be opened.

In order to trace a hardware error easier, each Nord synthesizer has a test program. This program is primarily used in production in order to test all functions.
The functions provided by the test program allow a quick and easy search for possible errors in the hardware. Test results are shown on the Electro's display. If a test is successful, the display reads "rd". If errors are detected, an error code is shown in the display. The error codes are listed under the section "Error codes" in this document.

⚠ **WARNING:** Improper use of the test program can result in malfunctioning of the synth. It may only be used by qualified service personnel and is not intended for end users.

In order to execute the different tests on a Nord Electro, press and hold buttons **[program 1+3+5]** at power up.

Navigating through the test program
When the test program is started all LEDs and the LED display should be lit.
After finishing each test successfully, the test program jumps forward to the next step.
The active test is shown in the display.
To toggle manually between tests, press **[shift + up]** or **[shift + down]**.

88 LEDs and button Test

Press all buttons to switch off the LEDs. Once switched off, they can not be switched on again without restarting the test. Switching off all LEDs makes the test jump forward to the next stage.

Hn Knob Test

Turning a knob from fully counter clockwise to fully clockwise should generate a value between 0 and 7F, respectively. The value is shown in the display. It should change linearly with the potentiometer travel.
Turning each knob fully counter clockwise to fully clockwise make the test jump forward to the next stage.

Hb Keyboard Test

Press one key at a time to check its function. If a ”note on” message from that key is detected, the display counts up one step. When all keys are pressed the test jumps forward to the next stage.
This test does not report velocity response.

Pd Pedal Test

Connect a sustain pedal to the sustain pedal input, a switch pedal to the Rotor speed input and a control pedal to the Control pedal input. Pressing and releasing the sustain pedal should generate values 0 and 7F, shown in the display. This applies to the Rotor speed input as well. Rocking the control pedal back and forth should generate values between 0 and 7F, shown in the display.
To make the test jump forward to the next stage, unplug all pedals and then reconnect and unplug the control pedal.

d1 DAC Test

This test should output a clean sine wave on the left (d1) and right (d2) outputs.
Toggle the output with **[STORE]**.
Adjust the volume with the volume knob. If the output is distorted, try adjusting the trim pots found in the lower left corner of the main board. (Nord Electro main board v1.0)

VR1 Right channel (d2)	VR2 Left channel (d1)

Test Program version 0.18 (BootPROM 2.2-06) and never has the possibility to Change level by pressing **[program 1]** through **[program 4]**.

Program 1	Program 2	Program 3	Program 4
-80dB	-60dB	-40dB	-20dB

You can change frequency of the sine using the Presence Frequency knob.
⚠ **Note:** The scale printed around the knob is not related the frequency of the sine.

FL FLASH memory Test

⚠ **WARNING!** The Flash test does not preserve data. This means that if you perform the Flash test described in this section, data is lost and must be updated.
Press **[shift + octave up + octave down]** to execute Flash test.

In order to erase OS content, press **[shift + octave up + program 5]**. To verify that the OS section is empty, press **[program 5]**. When the test is finished, the display briefly shows 'rd'.

In order to erase sound data in Flash, press **[shift + octave up + program 1]**. To verify that no sound data exists, press **[program 1]**. The display starts counting up to 99. When the test is finished, the display briefly shows 'rd'.

EP EEPROM Test

The EEPROM test does not alter data in the EEPROM. When the test is finished, the display briefly shows 'rd'. If the test stops, there are likely errors on either the EEPROM or surrounding connections
Press **[shift + octave up + octave down]** to execute the EEPROM test.

Error Codes

BootPROM error codes:

E.0 Recv SysEx error (overflow or other low level error)
E.1 Recv begin error (SysEx begin message error)
E.2 Recv data error (SysEx data message error)
E.3 Recv end error (SysEx end message error)
E.4 OS erase error (can't erase OS in Flash)
E.5 OS write error (can't write OS to Flash)
E.6 No OS detected (no OS in Flash)
E.7 OS load error (OS with errors in Flash)
E.8 Flash init error (can't init Flash chip(s))
E.9 Flash unknown (unknown Flash chip(s))

Piano init error codes:

P.1 Invalid or missing file
P.2 Map file main type is invalid
P.3 Invalid file(s)
P.4 Invalid file(s)
P.5 Invalid file(s)
P.6 Invalid or missing file

(Hold [instr. select] at power up to init piano without loading samples.)

USB download error codes:

F.1 Initial USB transfer checksum error.
F.2 Flash Error: Create file error.
F.3 Flash Error: Write file error.
F.4 Communication Error: Data overflow.
F.5 Communication Error: Data underflow.
F.6 Communication Error: Verification error.
F.7 Flash Error: Failed to calculate flash checksum.
F.8 Flash Error: Checksum error.
F.9 Flash Error: Close file error.
F.a USB Error: Internal error.
F.b --- error code not used ---
F.c USB Error: PID encoding error.
F.d USB Error: PID unknown.
F.e USB Error: Unexpected packet.
F.f USB Error: Token CRC error.
F.G USB Error: Data CRC error.
F.h USB Error: USB chip error.
F.J USB Error: Unexpected EOP.
F.n USB Error: Sent/received NAK.
F.o USB Error: Sent stall.
F.P USB Error: Overflow error.
F.r USB Error: Bitstuff error.
F.t USB Error: Invalid data PID.
F.y USB Error: Unknown error.

Hardware

Hardware structure

The hardware structure is common for all three Nord Electro products;
one power supply unit, one main board and one panel board.

Power Supply
The Nord Electro is supplied with several different voltages from the power board. These are +3.3V, ±5V and ±12V. For more information on where to measure these voltages see the appropriate schematic.
The Power supply is connected to the main board with a 10 pole connector **P2** *(22480).*

Main Board
The main board is equipped with two DSP´s **U6**- **U7** *(21360)* which are controlled by a host processor **U8** *(21320)* with two RAM circuits **U9-U10** *(21410)* (128k*8 bits each).
The boot code and the test program is stored in the boot BootPROM **U17** *(23700).*
OS and sampled sounds (all sounds except organ) are stored in four Flash circuits **U1-U4** or **U13-U16** *(21400)* (4M*16 bits each).
Audio D/A conversion is done by **U20** *(21600, mnb v2.x-23430)*. A/D conversion of the control pedal takes place on the panel board **U7** (see panel schematic for details).
All input and output jacks are filtered from radio signals with an EMI-filter *(23110, 23100)* (component designator prefix F). External connectors are a 26 pole connector **P6** *(22520)* for the panel board, a 10 pole connector **P8** *(22480)* for the power supply unit and two keyboard connectors **P1-P2** *(P1=22670, P2= 22680).*

Panel Board
On the panel board you will find all control functions of the Nord Electro.
The model of the Nord Electro is hardware configured on the panel board.
See section ”Hardware configuration” for details.
The panel board is connected to the main board with a 26 pole connector **P1** (22520).

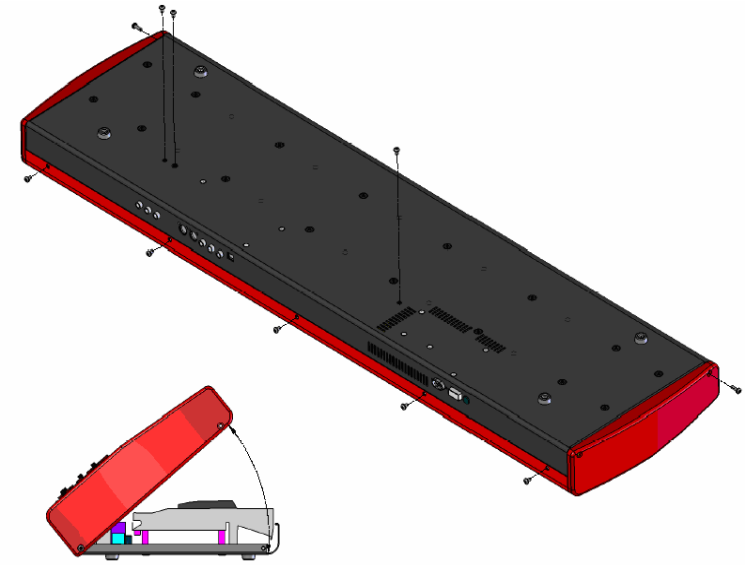
Opening the synth

WARNING: Take necessary precautions against ESD before opening the synth.

Electro 73
Loosen the screws as shown in the figure (2x40038 + 7x40018). The two screws on the sides work as hinges. Lift in the front to open the top.

Electro 61
Opens similar to the Electro 73 (2x40038 + 6x40018)

Rack version:
Unscrew the 4 panel screws *(40018)* Gently slide the top forward and lift it of.



Picture shows Nord Electro 73

Removing the Power Supply Unit
Loosen the five screws *(40262)* holding the PSU to the chassis. Loosen the two screws *(40013)* on the back panel next to the AC socket. Finally remove the 10 pole ribbon cable *(NE 61/73 - 22390 NERack - 22430)* and lift out the PSU.

Removing the Main Board
Loosen the four screws *(40262)* holding the main board to the chassis. Loosen the nuts and remove the washers around the ¼" jacks on the back panel. Also loosen the four screws *(40010)* holding the MIDI jacks to the chassis. Remove the 26 pole ribbon cable *(22410)* to the panel board, the 10 pole ribbon cable *(22390)* to the PSU and the two ribbon cables to the keyboard *(P1-22420, P2-22290).* You can now lift out the main board.

Removing the Panel Board
Pull off all knobs on the front panel (not the buttons). Remove the ribbon cable *(22410)* from the panel board. Loosen the last two screws *(40038)* holding the top to the chassis. Loosen the nine screws *(40262)* holding the panel board to the upper lid.
You can now lift out the panel board.

Hardware configuration

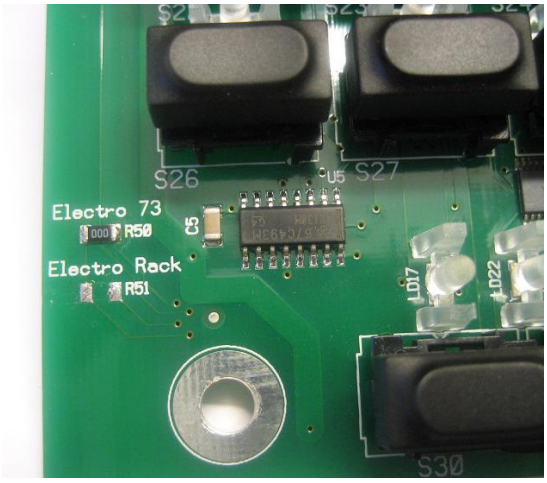
The Electro model (61, 73, rack) is decided by two 0 (zero) ohm resistors **R50-R51** found in the lower left corner of the panel board. In order to reach the resistors, the panel board needs to be detached.
See section “Opening the synth” for details

If the panel board is not properly configured, you get problems like:
- High notes trig low notes or notes are trigged randomly.
- Keyboard not working at all.
- Buttons affect other parameters.

Zero ohm resistor in pos.

	R50	**R51**
Electro 61	No	No
Electro 73	Yes	No
Electro Rack	No	Yes

The picture to the right shows how a panel board for an Electro 73 should be configured.



Hardware versions

Main board	**BootPROM**	**Notes**
ver. 1.0	v0.32	
ver. 2.2	v2.2-xx	New DAC

⚠ Important note

-Never mount an old BootPROM (prior to 2.x-xx) on a new main board (v2.x or newer).

-Never mount a new BootPROM (2.x-xx or newer) on an old main board (prior to v2.x).

-The latest available OS version (and piano samples) will work on all officially released main board versions, however old OS versions might NOT work on newer main boards Always use the latest OS version!

Software

Uploading OS and sounds
The operating system and sampled sounds are stored in Flash circuits on the main board. OS is uploaded via MIDI, and sounds are uploaded via USB.
For more information on how to update the OS and uploading sounds Visit www.clavia.se there you can find the latest Software packages.

Current OS version is shown in the Electros display when you power on the unit.

⚠ Important Update Note
The samples used for OS version 1.x and 2.x are not compatible with OS 3.00 therefore updating the Nord Electro OS to v3.00 will make it necessary to update to the latest piano library v3.x as well.

Factory presets
The factory programs are available as a MIDI Sysex file for download at www.clavia.se
Please refer to the Nord Electro user manual for information on how to restore the factory presets.

Spare Parts

Mechanical:

Part no.	Item
22410	Ribbon cable 26 pol N3/NE/NM/NER
22290	Keyboard cable
22390	Ribbon cable 10 pol NL3/NE61/73
22410	Ribbon cable 26 pol N3/NE/NM/NER
22420	Keyboard cable
22430	Ribbon cable 10 pol NR3/NER
22460	Cable clip, adhesive
22900	Knob D-form with grey line
40004	Keyboard 5 Oct. NE61
40006	Keyboard 6 Oct. NE73
40010	Screw, midi
40013	Screw, AC input
40017	Screw, keyboardNL2/transformer
40018	Screw, upper/lower lid
40039	Screw, keyboard E61/E73
40040	Screw, keyboard NL3/Wood NE61/73
40068	Pop rivet 3,2x8
40070	Rubber foot 19mm
40080	Display window, red NE/NS
40086	Rack ear NER
40106	Upper lid Electro61
40107	Lower lid Electro61
40114	Upper lid Electro73
40115	Lower lid Electro73
40116	Upper lid Electro Rack
40117	Lower lid Electro Rack
40228	Angle bracket, support NE
40231	Wood side Electro61, Left
40232	Wood side Electro61, Right
40233	Wood side Electro73, Left
40234	Wood side Electro73, Right
40262	Screw M4x6
40267	Screw, woodside E61,73 outside

Panel board:

Part no.	Item
69069	Panel board Electro
20960	10uF/35V 5,0x6,0 Ellyt SMD
20700	Diod Bav70 Sot23
21950	Transistor BCX53 Sot89 PNP
21930	74HC245 TSSOP
21940	74HC374 TSSOP
21920	74AC138 So16
21590	MAX1113CEE 16QSOP
21580	Max1112 Cap 20ssop
21810	74HC32 So14
20780	LED Eight
22520	Connector 26 pole
22030	Button black Nord/ddrum
22050	Button grey NE
22040	Button red Nord
20860	LED lens single, N2X/N3/NE/NM2
20870	LED lens straight, NE
20640	Pot.10kA Lin. Nord
20840	LED lens 6, N3/NE
20850	LED lens shield 6, N3/NE

Power board:

Part no.	Item
69074	Power board N3/NE/N2X
20910	Capacitor 4700pF X2
20950	10uF/63V 2m Elektrolyt
21020	3300uF/25V 85gr Ellyt axiell
20990	1000uF/40V 85gr Ellyt axiell
50061	Plastic strip black 200mm
20930	100nF/63V/10% 2m Polyester
20730	Diod 1N5404 3A
22840	Fuse house nord/dd4/mod
40076	Heatsink
23120	Drossel RN112-0,8/02
22620	Socket AC N3/NE
22480	Connector 10pol
22000	Powerswitch On/off
22020	Button grey power on/off
22630	AC-Switch
22780	Trafo N2X/N3/NE Eur/Usa
40017	Screw, keyboardNL2/transformer
21650	Regulator -3,3 BT
22960	Insulating insert TO-220
40042	Screw, regulator powerboard
40056	Nut M3
21660	Regulator -5Low
21680	Regulator +12V
21700	Regulator -12V
21690	Regulator -5V
40176	Plastic isolator
40180	Spacer 2mm Nylon

Main board:

Part no.	Item
69070	Main board Electro
20980	100uF/16V 6,3x6,0 Ellyt SMD
20940	1uF/35V 4,0x5,5 Ellyt SMD
20960	10uF/35V 5,0x6,0 Ellyt SMD
20970	47uF/35V 6,3x6,0 Ellyt SMD
20700	Diod Bav70 Sot23
25305	Diod S1G SMA
23110	EMI-Filter 2,2nF,+50/-20% 100V
23100	EMI-Filter 470pF,+50/-20% 100V
21970	Transistor BC847B Sot23 NPN
21960	Transistor BCX54 Sot89 NPN
21950	Transistor BCX53 Sot89 PNP
21980	Transistor BC857B Sot23 PNP
21400	Flash NE/G2
21940	74HC374 TSSOP
21360	DSP N3/NE/N2X
21320	Host N3/NE/N2X
21410	SRAM 1Mb N3/NE/N2X
21910	74LV138D
21400	Flash NE/G2
23700	BootPROM NE, programmed
21300	EEprom N2/dd4/El/NMG2
21900	74LV08 So14
21600	Dac N/NM/NE/dd4
23430	Dac N2X/NMG2/NS
21810	74HC32 So14
21520	Op amp LM833M
21420	USB circuit, NE
21570	PC 400TSo
21480	LF353D So 8
21500	Resetcircuit N3/NE
21800	74HC14 So14
25604	74LCX14 TSSOP
23080	Crystal 32,768 KHz SMD
23060	crystal 6 Mhz SMD
25351	Crystal oscillator 16,6666 MHz
22600	Connector 1/4" Stereo
22590	Connector 1/4" Mono
22640	Connector din 5pol Midi
22680	Connector 20 pole, micromatch
22670	Connector 16 pole, micromatch
22520	Connector 26 pole
22480	Connector 10pol
22690	USB connector Type B